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ABSTRACT

The overall educational strategy used by the Nova High School of Broward County was to use all of the major educational innovations, such as team teaching, individualized instruction, and flexible student grouping, which had been developed and tested in separate schools during the 1960's. Since the Nova Plan is essentially a trial combination of these separate innovations it was evaluated as a whole. The evaluation can be characterized as a causal-comparative study in which changes over two-year periods in the achievement and school related attitudes of two sequential sets of Nova students were compared with changes in the achievement and attitudes of students from other county schools. A crucial finding of the first year of operations was that the Nova Plan could not be implemented under the conditions of an overcrowded school plant, or even under an enrollment based on the ratio approaching but one seat per student per instructional unit. The problems surveys indicated an acute lack of effective vertical lines of communication between teachers and administrators, and of horizontal lines within faculty and administration separately. [Not available in hard copy due to marginal legibility of original document.] (JM)

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A FIVE YEAR EVALUATION OF THE NOVA SECONDARY SCHOOL

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A Five Year Evaluation
of
The Nova Secondary School*

The Nova High School of Broward County, Florida, was designed to incorporate the educational innovations of the 1960's and has served as a demonstration school for the community, State and Nation. This paper summarizes the procedures, findings and implications of an extensive evaluation of the Nova High School during its first five years of operation.

The Nova program should first be understood in terms of the educational philosophy, psychology, and the educational strategy which it employs. The original Director and certain Staff members published a booklet entitled The Nova Plan for Instruction (Wolfe, et al, 1963), in which they postulated that the adult product of a good educational program should (a) show intellectual curiosity, (b) value and desire to make logical and rational decisions, (c) develop mastery through understanding, and (d) enjoy working with problems.

From these postulated adult characteristics, the authors of The Nova Plan deduced that Nova should develop the following capabilities in the student:

(1) to recognize and understand problems within his environment;

(2) to respond to problematic aspects of his environment in a logical and sequential manner;

(3) to apply an analytical viewpoint in seeking solutions to problems;

(4) to gain pleasure from the process of problem solving as well as from the final solution itself;

* This is a summary of a final report entitled An Evaluation of the Nova Schools Between 1963 and 1968. Permission for dissemination of the final report has been granted ERIC and the School Research Information Service (SRIS) of Phi Delta Kappa, Eighth & Union, Bloomington, Indiana (47401).

(5) to weigh optional solutions in terms of their accuracy; rather than accepting an easily obtained solution, and

(6) to seek out the wonders of "why" and gain satisfaction from finding out.

These general student capabilities were further analyzed by the several departments, and each attempted to make the general statements more explicit in terms of the language specific to its particular discipline. These expanded, adapted and more explicit sets of statements became the "process goals" of the several departments, and, collectively, of the Nova school.

In the opinion of the researchers, the basic psychological theories underlying the process goals were not well formulated in the Nova Plan, nor were they clearly understood by the faculty. Much was assumed about learning as an exciting, self-directing process inherent within each student, but little was said of the specific conditions under which this latent process would become activated, and less was said about how optimal conditions for each student were to be brought about. In a post 1965 Nova document, it seemed that "learning by discovery" had been simultaneously selected as a promising theory by instructors in the sciences and mathematics.

The overall educational strategy of Nova was to institute simultaneously a number of educational innovations, each of which reportedly had been tested individually in other schools, and to make whatever modifications and adjustments necessary to their mutual compatibility and effectiveness in the attainment of Nova's goals. The principal innovations included such things as team teaching, individualizing instruction, flexibility in the grouping of students, flexibility in the use of instructional space, the use of closed circuit television and other mechanical devices; abundant learning resources, and large measures of

self-responsibility on the part of the students. Within each of the five principal academic areas (science, language arts, mathematics, social studies, and technical science), promising curricular strategies were to be developed, and incorporated within the general framework of the school.

In a basic sense the program of the Nova school was the experience of trying to reach the learning goals presented in the basic philosophy, utilizing whatever psychological principles seemed promising, within a setting of innovations whose compatibility was unproven. Within this program, length of class period, numbers and kinds of courses, content organization, student scheduling, etc., were mechanical problems which had to be solved as the faculty and students progressed, and often had to be resolved as conditions changed.

THE RESEARCH DESIGN

Since the Nova Plan is essentially a compilation of educational innovations which had been instituted separately elsewhare in the country, the research program was aimed primarily at evaluating the total Nova Program rather than specific aspects of the Nova Plan. It was decided that comparisons of the Nova Plan with existing school programs in Broward County would provide the most appropriate research design for the purpose of local school planning.

To reduce the risk of a premature evaluation of such a new and complex school program, studies were projected over a period of five years. The first set of longitudinal studies includes base line data collected on seventh and ninth year students at Nova and the control schools in the Fall of 1963, and follow-up data on the same students in the Fall of 1965 and Winter of 1966. The second set of longitudinal studies followed the progress of seventh and tenth year students of 1965 through slightly more than two years of school, with post-testing

completed in December of 1967. Thus, the evaluation of Nova can be characterized as a causal-comparative study in which changes over two-year periods in the achievement and school related attitudes of two sequential sets of Nova students were compared with changes in the achievement and attitudes of students from other county schools.

Experimental control was executed insofar as possible by selecting control schools with students of comparable abilities and socioeconomic backgrounds. Nonetheless, preliminary results indicated that Nova students would be expected to achieve at a higher level on the basis of superior ability and home background alone. Multiple linear regression analysis was used to statistically control for such biases in the analysis of the data. Experimental control was also accomplished by standardizing procedures for test administration and scoring.

The kinds of changes to be evaluated were identified by analyzing the Nova Plan in terms of its objectives, its proposed innovations, and the implications of said objectives and innovative procedures. The next step was to select and develop instruments to measure the extent to which the innovative procedures were actually implemented, and the degree to which the objectives were achieved. To insure the relevance of evaluation criteria to program objectives, Nova personnel were directly involved in the selection and development of instruments, including most of the achievement tests. In addition to measures of student achievement, aptitute, attitudes and peer relations, student and teacher opinions on classroom activities, problems of program implementation, and the extent of program implementation were surveyed periodically. These opinions provide the major source of information as to which innovations were, or were not, effectively implemented at Nova.

The evaluation focused on the academic areas of English, mathematics, science and social studies, with relatively little evaluation in the areas of technical science, physical education, foreign language, or fine arts.

FINDINGS

Student Achievement

The purpose of the first longitudinal achievement study was to compare Nova students with those in two junior high control schools in the Metropolitan Achievement Test (MAT), which was then the official achievement criterion for the Broward County schools. This purpose was accomplished by administering the MAT to entering seventh year students in 1963 and retesting them as ninth year students in 1965. Regression analyses were run on the posttest (1965) scores with pretest, School and College Aptitude (SCAT) and parental occupation data as concomitant variables.

In terms of the expectation that Nova Junior High students perform at least as well as control students on conventional tests such as the Metropolitan Achievement Tests, it may be said that Nova met expectations in Reading, exceeded expectations in Arithmetic Computation and Arithmetic Problem Solving, but fell below expectations in Total Language, Social Studies Information, and Science.

The Nova Faculty, however, expressed dissatisfaction with the MAT as being an inappropriate if not totally unrelated test of their objectives. Specifically, they objected to the great emphasis placed on recall of information and the absence of items related to the higher mental processes with which the new curriculum movement is concerned.

An analysis of teacher assigned grades, on the other hand, revealed that the 1963 MAT scores correlated more highly with grades assigned by Nova teachers than with grades assigned by teachers in the control

schools. The correlations between teacher assigned grades and MAT scores in grade seven, for instance, ranged from .28 to .50 with a mean of .40 for School X, from .41 to .65 with a mean of .51 for School Z, and from .49 to .68 with a mean of .59 for Nova. Thus, while the MAT was a relatively poor measure of the stated objectives of the Nova faculty, it proved to be a relatively good predictor of the kinds of achievement the Nova teachers were rewarding with grades during the first year. Nonetheless, the Nova faculty's objections to the Metropolitan Achievement Test were generally well founded, and more suitable tests were selected and developed for the second longitudinal study. New control schools were also selected, primarily because of an anticipated redistricting in 1967 which might have resulted in a serious loss of students in one of the original control schools. The inclusion of new schools also broadened the sample of programs with which to compare Nova. The new schools, designated "S" and "T" at the junior high level and "U" and "W" at the senior high level, were selected to provide a high standard of performance by students of comparable ability and background.

The second longitudinal study of achievement was more comprehensive than the first in several respects. Both seventh and tenth year students were tested in 1965, and retested in 1967. Two achievement batteries were used at each grade level. The Stanford Achievement Test (SAT) was substituted at the junior high level for the Metropolitan Achievement Test, the Test of Academic Progress (TAP) was used at the tenth grade level, and the Differential Aptitude Test of Abstract Reasoning (AR) was used at both grade levels. Supplementary tests, the Florida State University-Broward Experimental Tests (FBET), were developed specifically in terms of Nova objectives and administered to students at both the junior and senior high levels.

In addition to these multiple choice achievement tests, the Nova faculty requested the inclusion of supplementary tasks which would require the students to construct their own answers. For this purpose, pre and post data were also obtained on a set of Mathematical Proofs, the Consequences Test of Divergent Thinking, and the STEP Essay Test.

The analysis of data also differed for the second longitudinal study. The 1965-67 analyses provided separate results for boys and girls on the pretest, the posttest, and the posttest with adjustments for initial differences on the pretest, SCAT and educational level of the parents.

The results of the multiple choice achievement tests are summarized in Table 1, and it is evident that the expected margin of superiority on achievement tests selected and developed by the Nova faculty did not materialize. Although Nova students maintained a clear margin of superiority over students in Schools S and U, they more frequently lost than gained relative to School T Junior High and School W Senior High students.

Table 1

The Number of Changes Between Pre-and Posttest Results Which Favored Nova (N) vs. the Number of Changes Which Favored Control Schools S, T, U & W

	Junior High Comparisons						Senior High Comparisons						Totals	
Sex	N vs S		N vs T		N vs TC		N vs U		N vs W		N vs TC		N vs TC	
Girls	7	5	2	10	9	15	7	3	5	5	12	8	21	23
Boys	10	2	4	8	14	10	7	3	4	6	11	9	25	19
Totals	17	7	6	18	23	25	14	6	9	11	23	17	46	42

The major exception to this general conclusion is found in the consistent superiority of Nova Senior High Students on the mathematics tests. Nova seniors were also superior on the science tests in 1967, and Nova Junior High students scored higher on the Abstract Reasoning test in 1967. Unlike the control schools, all Nova Senior High students were required to take mathematics and science every trimester, and all Nova Junior High

students were required to take technical science courses which were designed to develop the abilities called for by the Abstract Reasoning Test. These curriculum requirements, therefore, may have been the specific innovations in the Nova Program which resulted in the exceptional performance of Nova Senior High students on the various mathematics and science tests, as well as the superior gains made by Nova Junior High students on the Abstract Reasoning Test.

Posttest differences between Nova and Control students on the STEP Essay and the Consequences tests were minimal and inconsistent. Nova students, however, were clearly superior on the Mathematics Proofs in 1965, and by 1967 Nova students, especially Nova girls, had increased their superiority on the Mathematics Proofs in comparison with the control groups.

Student Attitudes

A second major concern in the development of Nova was that of improving student motivation and attitudes. An analysis of the Nova Plan led to the following postulates concerning the relevance of the Nova Program to student attitudes:

(1) To the extent that Nova's program for continuous progress reduces academic failure and frustration, there should be a reduction in school related anxiety (School and Test Anxiety) and aggression (Need Aggression).

(2) To the extent that the Nova program for continuous progress and individualization is based on student self-pacing and self-reliance, there should be increases in feelings of autonomy (Need Autonomy) and decreases in dependency on authority (Authoritarian Discipline) and anxiety relating to self-reliance (Autonomy Anxiety) and self-assertion (Dominance Anxiety).

(3) To the extent that the policy of countywide voluntary enrollment in a nongraded school program weakens neighborhood and school social affiliations, feelings of Social Inadequacy and Alienation will increase.

(4) In addition to these specific hypotheses, one would expect measures of general attitudes toward school (Positive Attitudes Toward School and Negative Attitudes Toward School) to differentiate between Nova and the control schools.

In order to determine the impact of Nova in the affective domain, data were collected on a number of self-report attitude scales reported in the research literature, and those which had factor validity for the local population were combined into the Student Attitude Inventory (SAI). The analysis of the SAI data followed the same general pattern described for the analysis of achievement data in the second longitudinal study, with the exception that additional concomitant variables were used for the purpose of statistical control. In addition to scores on the pretest and the parents' educational data, the SAI analyses included Social Desirability and Defensiveness data collected as part of the Student Attitude Inventory.

Of the twelve comparisons made between Nova and the various control groups (N-S, N-T, N-U, N-W, N-X, and N-Z boys and girls separately), in no case did the results consistently support the hypothesized advantages of the Nova Plan. On the contrary, the overall changes in attitudes between pre and posttesting typically favored at least one, and sometimes both of the control groups. Specifically the results indicate that although Nova was less conducive to dependency on authority among adolescents, it was not particularly effective in reducing school and Test Anxiety, Autonomy Anxiety, Dominance Anxiety, or Need Aggression.

Nor (surprisingly) does the data indicate that Nova was generally more effective in fostering a desire for autonomy in the students, for the gains of the high ability Senior boys were offset by the decreased desire for autonomy by low ability Nova boys. Over a two-year period Nova students, with the exception of the 1968 senior boys, had become less positive and more negative than the control groups in their general attitudes toward school, and more often expressed increased feelings of Social Inadequacy and Alienation. These negative attitudes were most frequently expressed by the more scholastically capable Nova students, especially the bright senior girls.

Student Reactions to Specific Subjects

The attitudes and changes in attitudes described above were of a general nature, i.e., they were designed to reflect the students' feelings about the academic and social climate of the school in general. In order to determine student reactions to specific academic subjects, students were asked to indicate which three of a list of ten positive and negative adjectives (e.g. stimulated-bored) best described their feelings about each of the academic courses they were currently taking. The results are presented in terms of the percentages of students who marked at least as many (if not more) positive adjectives as negative in response to a given academic subject.

Reactions of students to Nova courses varied widely, ranging from a low of 22% positive response to English by low ability (SCAT raw score 60) ninth year boys to 89% positive response to Science by the same group in 1966, as might be expected. Low ability students tended to react less favorably than either average or high ability students, and girls were more positive about English while boys responded more

favorably to Mathematics and Science. As can be seen in Table 2, Nova students became less favorable toward their courses over a two-year period in 22 of 32 observations. This reflects in part the highly positive initial reactions of the more impressionable seventh year Nova

Table 2

Percentages of Nova Students Responding Favorably to Academic Courses on the Adjective Check List in Two Longitudinal Studies.

Subject	Sex	1963 - 1966 N[1]	7 - 9	N	9	11	1965 - 1967 N	7 - 9	N	10	12[2]
English	Boys	163	75	48	56	55	45	120	72	64	85	31	43
	Girls	126	78	62	51	56	76	132	86	74	75	49	59
Mathe-matics	Boys	163	75	70	56	58	82	120	74	60	85	79	75
	Girls	127	67	63	51	46	55	133	65	49	75	73	53
Science	Boys	164	93	81	56	80	58	120	84	67	85	74	68
	Girls	126	89	69	51	70	51	132	71	64	75	48	41
Social Studies		163	66	61	56	42	64	120	80	66	85	55	83
		126	49	64	51	35	63	132	84	76	75	53	81

[1] N = Number of subjects

[2] Grade levels at which a given group was tested, e.g., the 10-12 columns contain percentages on tenth grade boys and girls in 1965 and the follow-up data on them as twelfth graders in 1967.

students in contrast to the more stable responses of senior high students whose positive reactions increased over time about as they decreased. Comparison of these data with control school results favored Nova Mathematics program in 1965-66 and the Nova Social Studies program in 1967. The English program, on the other hand, was not as well received (according to the ACL) by Nova students as were the English programs in the control schools. Although students were initially (1963) more favorable to the Nova Science program, no consistent patterns developed in later years.

In the second longitudinal study, students were also asked to indicate their reactions to their elective courses. Two overall indices were calculated for each student. The first was based on reactions to the "hard core" academic courses only and the second was based on reactions to electives as well as to the core courses. In general, reactions to the program, including electives were more positive than reactions to the core courses. The results favored Nova on both of these indices in 1965, but tended to favor the control schools in 1967.

The low percentages of positive reactions by low ability Nova students is consistent with the incidental finding that, in comparison to average and high ability students, fewer low ability Nova students were available for retesting in 1966. This raises for consideration two features of the Nova program which are important to the interpretation of the results.

First, all Nova students were required to take English, mathematics, science, and social studies every trimester, while many ninth year students in the control schools had the option of not taking science or social studies in the Spring of 1966. Students who strongly disliked Nova, on the other hand, had the option of returning to their neighborhood schools.

Student Opinions

Student opinions regarding specific aspects of the school program were surveyed in 1963, 1965, and 1967, with results favoring Nova developing in later years. In 1967, Nova students generally expressed greater satisfaction on items relating to classroom procedures and the curriculum and were equally satisfied with the several other areas of student-teacher relations, grading procedures, the emphasis on academics, and general reaction to school.

In the area of classroom procedures, Nova students expressed greater satisfaction with the balance in (1) utilization of lectures, audio-visual presentations, and group discussions, (2) teacher control and student freedom, and (3) memory work and comprehension of ideas.

Nova students also expressed less dissatisfaction with teacher efforts to individualize instruction, but even at Nova 40% of the students felt that teachers paid too little attention to individual differences among students. Approximately one-third of all the students felt that teachers went too fast for them, and 35%-52% of the Nova students in particular felt that "students are on their own too much and have too little guidance and direction from teachers in their school work." Generally one-half of the students, including those at Nova, complained of too little personal interest on the part of their teachers.

Finally, between 56% and 84% of the control groups expressed a generally favorable overall reaction to their school program, and Nova boys and girls fell near the top of the distribution with a range of 74%-83%. In comparison with the less positive 1963 and 1966 results, the consistently favorable findings of the 1967 Student Opinion Poll may indicate a trend of improvement in the Nova Program. Further research would be necessary, however, to determine whether the more favorable results in 1967 reflect improvement in the Nova Program (as viewed by the students), or a greater withdrawal rate among those who were least satisfied with the Nova Program.

Peer Relations of Scholars, Athletes and Activities Leaders

In many secondary schools, the adolescent social-status hierarchy has developed in such a way that the adolescent scholar is seldom accorded the lofty position of the athlete or activities leader, and is

sometimes relegated to the bottom of the status hierarchy (Coleman, 1961).

The Nova Plan (Wolfe, 1963), however, places great emphasis on academic activities and the intellectual development of youth, and leaves considerable responsibility for extracurricular programs in the hands of parents and other community resources. The success of the Nova Plan depends in part on the extent to which the Nova student body, in accordance with the school's stated philosophy,[1] incorporates this renewed emphasis on academics in its own system of values.

A study was therefore designed to determine the kinds of peer status accorded Scholars, Athletes, and extra curricular Activities Leaders at Nova and the control schools. Peer nominations were used to identify the students reputed to be Scholars (e.g. Name two students who always get the best grades; i.e., they are the best students), Athletes, and Activities Leaders. Once identified, these groups of Scholars, Athletes, and Activities Leaders were compared in terms of the number of nominations received for other items such as: Wheel, "Name two persons in your grade who are in the leading crowd"; Positive Model, "Name two persons in your grade you would like to be like"; Adult Oriented, "Name two persons in your class who always depend upon their parents, teachers, and other adults for advices," etc.

On the basis of results of the seventh grade data in 1963, it would appear that efforts to reemphasize the primacy of academics at Nova were indeed accepted by the students and reflected in their social status system. Nova students accorded Scholars peer status equal to, if not

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[1] Results of the Teacher Opinion Survey indicate that the athletic program was not deemphasized in the opinion of the Faculty.

slightly favorable to, that of the Athletes and the Activities Leaders. Similar results, however, were found for seventh year control students, with the exception that control Scholars were much less often nominated as "Wheels" than were Nova Scholars.

At the ninth grade level in 1963, on the other hand, Scholars appeared to be at a distinct disadvantage in social hierarchy. The data revealed not only greater acceptance of Athletes and Activities Leaders in grade nine, when athletic and extracurricular activities typically become more pronounced, but also indicated social rejection of Scholars at grade nine. The contrast between the status of seventh and ninth year groups in 1963 was greatest at Nova, and this suggests the possibility that one or both of these groups were atypical of the Nova student body.

The follow-up studies at Nova[2] in 1966 revealed that only about one-third of the students maintained their reputations as Scholars, Athletes, and Activities Leaders over the two-year period. Nonetheless, the Activities Leaders of 1963 consistently maintained a highly positive image in terms of such nominations as "Wheel," "Best Friend," "Positive Model," "Party Pal," and "Independent Orientation".

The Scholars of 1963, however, received fewer positive nominations (but not more negative nominations), and the Athletes of 1963 received slightly fewer positive and slightly more negative nominations in 1966.

Further research on additional groups of Scholars would be necessary to determine if the results obtained in these studies represent a stable

[2]The cost of analyzing the follow-up nominations data in the control schools was considered excessive in terms of what it would add to the comparisons of Scholars, Athletes, and Activities Leaders at Nova.

pattern of decreasing peer status for Scholars at the higher grades, or a somewhat distorted pattern based on atypical samples of Nova students. The importance of furthering such research at Nova is indicated by (1) previous findings that social isolates and rejects of the adolescent society are characterized by personal maladjustment and social alienation (Coleman, 1961; Galliani, 1960; McGuire, 1960), and (2) the increased feelings of alienation reported by Nova students in the student attitudes study.

Teacher Opinions on the Problems and Progress of Program Implementation

Surveys of teacher opinions concerning the problems and progress of program implementation were carried out periodically at Nova. The results of these surveys indicate that implementation of the Nova Plan has been a slow laborious complex process fraught with problems, and yet not without its professional and personal rewards.

Table 3

Number of Innovations Judged by the Nova Teachers in Each Department to be of Extensive, Mixed, and Limited Satisfaction in 1967

Satisfaction[1/]	Eng	Math	Sci	Soc Stds	Tech Sci	For'n Lang	Phys Ed	Total Fac'l
Extensive (67%-100%)	1	5	5	5	0	3	7	3
Mixed (34%-66%)	13	12	14	14	13	15	12	17
Limited (0%-33%)	20	17	14	15	21	17	15	14
Number Teachers	12	12	12	13	12	7	7	75

1/ Percentages of teachers who fell within the 5 to 7 range on a seven point likert type scale of satisfaction.

The extent of progress in the implementation of the Nova Plan between 1963 and 1967 can be seen in Table 3. By 1967, only three innovations were rated as clearly satisfactory by two-thirds or more of the total faculty:

The data processing center

The policy of requiring all students to enroll in English, mathematics, social studies, and science each trimester.

The decentralization of library services and materials through the resource centers

At the other extreme, less than one-third of the total faculty expressed satisfaction with the degree of implementation of the following fourteen innovations:

The emphasis on "Process goals" in teaching

The Administrative structure (including the Director, Assistant Directors for Instruction and Administration, Administrative Assistants, Supervisors, and Department Heads) which serves as a basis for establishing a chain of command, areas of responsibility and lines of communications

The policy of extensive teacher involvement in the counseling and guidance program

Interdepartmental cooperation and communication concerning program development

The teacher inservice training program

The development of a counseling and guidance program pertinent to unique features of the Nova Plan

The modular scheduling of class time and SOUST to facilitate the individualization of instruction

Lecture halls for large group instruction and special programs in all departments

De-emphasis on extracurricular activities and athletics

There are several points of clarification necessary to the interpretation of the findings presented in Table 3. The interpretation of

such data in the evaluation of the Nova Plan depends in particular on (1) the goals one sets for program implementation and (2) on the expectations one has for faculty satisfaction as expressed by a positive response of 5-7 on a 7 point scale. It should not be assumed that extensive implementation is considered a possible or even desirable goal in all departments for all innovations. The mathematics teachers, for instance, expressed little desire for large lectures in the Math-Science Lecture Hall, and many physical education and technical science teachers understandably had reservations about the emphasis on a hard core academic curriculum. Thus, extensive implementation of all innovations is not necessarily an appropriate goal and should not be used as a rigid gauge of success in program development. Rather, satisfactory implementation in the opinion of 34%-66% of the faculty may generally be interpreted as indicative of a significant degree of satisfactory implementation.

Teacher opinion was also surveyed in connection with problems of program implementation. Perhaps the aspect of greatest significance in this study was the number, variety, and persistence of problems which occurred during the first year of implementation of the Nova Plan. The data suggest that with every additional innovation in the educational program there is a disproportionate increase in the number and variety of potential problems which may initially hinder program implementation.

Of the many problems reported by the Nova faculty, some apparently were of overriding concern to the teachers, while others were routine annoyances of no great significance. The problem of greatest concern during Nova's first year of operation (1963-64) was that of large class sizes, which in turn aggrevated other problems of great concern such as lack of adequate procedures for (1) advancing students at their own rate,

(2) evaluating students, and (3) dealing with students who failed to meet minimum program requirements in terms of ability and/or self-discipline.

The most obvious general source of difficulties for the teachers during the 1963-64 school year was the lack of time and opportunity to carry out their many responsibilities. Teachers were particularly concerned about the lack of time and opportunity for individual consultation with students, satisfactory planning, research and writing of advance units, professional improvement, and relaxation.

Of the many problems with building equipment and materials, only the lack of resource materials for depth and independent study remained a problem of great concern for teachers throughout the year. Of the various problems related to role delineation, only one, low teacher morale, was among the ten problems of greatest concern to teachers for the 1963-64 school year.

The modular schedule utilized in Trimester 2 of the 1966-67 school year, and especially the Schedule of Unscheduled Time (SOUST), apparently alleviated many of the long-standing scheduling problems at Nova by getting students out of overcrowded classrooms to spend more time on independent studies. The new schedule, however, seems to have aggrevated certain problems associated with the supervision of students and the individualization of the program to handle students who lack the ability or self-discipline necessary to effectively utilize a great deal of unscheduled time.

Perhaps the most significant problems in the 1966-67 survey were the six judged by teachers consistently over the year to be among the ten problems "which most inhibit the implementation of the Nova Plan".

Length of class period (i.e., the number and/or arrangement of modules for a given class is unsatisfactory)

Understaffed in teaching faculty

Lack of time and opportunity for satisfactory planning, research, and writing of activities packages

Lack of information and/or clearly defined effective procedures for:

Keeping track of students' whereabouts and activities on a daily basis (may include related problems such as inaccuracy of class rolls, students cutting classes, etc.)

Dealing with students who fail to make good use of "free" time for independent study

Dealing with students who fail to meet minimal program requirements in terms of ability, desire to learn, or self-discipline

In addition to these were three problems which came to light during the year and which were given high priority in June, 1967, by the total faculty.

Too much scheduled free time; too little class time

Inadequate orientation of students and teachers for major changes in program (e.g., lack of guidance for the students in the effective use of unscheduled time; inadequate inservice training and instruction in the development and use of activities packages)

Curriculum not yet ready to meet demands of a modular schedule requiring much independent study in SOUST.

Insofar as opinions are under discussion here, perhaps it is not inappropriate for the authors to speculate that the Nova faculty was somewhat more inclined than the typical faculty to be critical of conditions which did not meet expectations, and more frank about expressing criticism. This is not to say that it should have been otherwise, of course, for the results of achievement and attitudinal data indicate that reported problems of program implementation had serious implications for the total educational process at Nova.

Just as the nature of the faculty influences one's interpretation of the results of an opinion poll, so too does the nature of the program influence the interpretation of an opinion poll. Nova was a new school and an experimental school, and on both counts one would ordinarily expect many failures as well as successes. Consistent with the role of an experimental school, Nova introduced new procedures at the beginning of each year which often could not realistically be expected to operate smoothly by the end of the year when annual evaluations were made. Such yearly innovations typically lowered the overall evaluation slightly, even though many teachers commented that these innovations, when satisfactorily implemented, would be a step in the right direction. Thus, in experimental schools such as Nova, a multitude of problems and a variety of innovations at various stages of implementation may be the likelihood, not the exception.

Teacher Opinions Concerning the Benefits of the Nova Program

Lest the emphasis on the problems of program implementation result in a one-sided representation of faculty opinion, teachers were also asked to comment on the immediate and long range advantages of Nova. Teacher comments related most frequently to opportunities for professional development through working with the Nova faculty, especially in team teaching situations, and through association with many consultants and visiting educators. Many Nova teachers also felt that working with students in large, medium, and small groups, and on an individual basis in particular, provided an opportunity for better serving their students and for professional development as well. Another form of professional development, that of learning to cope with difficult and everchanging situations,

was mentioned by many teachers. One of the most frequent types of comments related to the teachers' opportunities to try out their own ideas and possibly contribute to the advancement of education on a broader scale. The opportunity to participate in curriculum development and the abundance of resource materials for curriculum development were often mentioned, especially in connection with Learning Activity Packages. Human resources such as technicians and teacher aides to assist in curriculum development also constituted an advantage in the opinion of some teachers. Such factors as air conditioning, laboratories and equipment, planning areas, closed circuit television, etc., were among the more obvious of the Nova advantages, and although the lack of adequate planning time was frequently mentioned as a recurring problem between 1963-1967, a number of Nova teachers commented favorably on planning time in this 1968 survey. The day-to-day variation in teaching and developmental activities (introduced in part by the modular scheduling procedure) apparently was much preferred by many to the routine of teaching the same fixed sequence of courses on a day-to-day basis. Finally, one of the most obvious short term advantages mentioned was the additional salary for the longer school year, and one of the likely long term benefits mentioned was the greater opportunity for career advancement through association with Nova.

One's first impression upon reading the complete transcription of the teacher comments is that these comments are totally inconsistent with the preceding findings of the problems and evaluation surveys. This inconsistency reflects the fact that problems and progress, advantages and disadvantages, are not mutually exclusive but closely intertwined dimensions of any large scale developmental project. Beyond the fact that one expects both problems and progress, the disparity between the

results of the various surveys may reflect, in varying degrees, the following factors:

1. The polarizing effect of concentrating on the negative aspects of Nova in the problems survey and the positive aspects in the benefits survey

2. The dedication of many teachers to the objectives of the program in spite of immediate difficulties in obtaining these objectives

3. The inclination to project a good image of Nova and/or defend Nova in the face of rumors that Nova may lose its status as a county-wide demonstration school

4. The improvement in working conditions as of the 1967-68 school year when the benefits survey was run

Teacher comments concerning the benefits of the Nova program for students were also obtained. The frequency of such phrases as "independent study," "self-pacing," "self-discipline," and "self-reliance," reflects a dominant concern among the faculty for developing a sense of responsibility in their students. A similar set of comments focused on the students' ability to cope with future challenging situations, especially college. Nova students hopefully were developing "a better understanding of learning"--an indepth "conceptual" orientation rather than a surface "factual" orientation to future academic work. The faculty also commented on the benefits of an academically stimulating faculty and student body, as well as the benefits of a well-articulated academic curriculum of unusual depth and breadth. The benefits of Nova's superior school facilities and the prestige of graduating from Nova were also mentioned by some of the faculty.

Viewed in the context of available student opinion and self-report data, it would seem that teacher impressions of the advantages of the Nova program for students were essentially valid in some cases while unfounded in others. It should be noted, however, that in this survey

teachers were not asked to give an objective evaluation of accomplishments to date, but to state their impressions of the long range as well as immediate advantages. It may well be that the benefits of the Nova program at this stage of development are those of post high school success rather than superior achievement gains during high school.

Independently of either the immediate or potential reality of these benefits, it seems clear that the faculty, while aware of the many problems that confront them, were nonetheless dedicated to a set of objectives developed around the dominant theme of student self-reliance.

COMMENTS ON PROGRAM IMPLEMENTATION

In view of the ideographic nature of the data, generalizations about the problems and progress in implementing the Nova Plan are not entirely justified. As a case study, however, the data contain certain implications which, in the interest of future endeavors, cannot be ignored. Specifically, the various surveys indicate that in the pre-planning and implementation of programs based on or similar to the Nova Plan, great emphasis should be placed on (1) enrollment policy, (2) scheduling, (3) administrative structure, and (4) intensive programs of teacher training and curriculum development.

One of the most crucial findings of the first year of operation was that the Nova Plan could not be implemented under the conditions of an overcrowded school plant, or even under an enrollment based on the ratio approaching but one seat per student per instructional unit (i.e., classrooms, lecture halls, etc.). As this ratio was approached, it became increasingly necessary to schedule large lecture rooms and conference rooms for regular classroom use, thus defeating the purposes for which

these rooms were designed. The optimum enrollment figure can only be determined through experience, but it would appear that full implementation of the Nova Plan requires more instructional space per student than the conventional program.

It seems especially important to restrict student enrollment during the first several years when the resources of faculty and staff are, of necessity, being committed to intensive inservice training and curriculum development, in addition to instruction. Until teacher training, curriculum development, and ungraded scheduling have been satisfactorily accomplished, the Nova Plan cannot be fully implemented at the instructional level - and until the Nova Plan is implemented at the instructional level, a high student-teacher ratio is certain to give rise to more problems than would be expected in a conventional program. Thus, a high student-teacher ratio should logically be among the last, not the first, aspects of the Nova Plan to be implemented.

Scheduling is ranked second to enrollment only because once a certain maximum enrollment is exceeded, satisfactory scheduling cannot possibly be achieved. When the proper ratio of students-to-teachers-to-space does obtain, however, scheduling is the key to the Nova Plan. Indeed, the Nova Plan may be defined as a program in which teachers are scheduled to teach together and plan together, in which special purpose rooms are scheduled as needed for large or small group instruction, in which instructional resources are scheduled for optimal accessibility to allow students to move through each subject at their own rate, and in which faculty and staff are scheduled to participate in programs of inservice training, curriculum development and team teaching. Obviously, scheduling

at Nova is no routine matter. On the contrary, the complexity and problems of the Nova Plan are nowhere more immediately evident than in the scheduling process.

The very complexity of the Nova organizational pattern attests to the importance of the administrative structure through which the organizational pattern must be established and maintained. The highly abstract process goals, the complicated procedures for evaluating student progress, the technical operations of electronic data processing and closed circuit television, the multimedia, multi-group methods of instruction, and the mass of content in an expanding curriculum - all of this and more must be effectively communicated between consultants, administrators, and faculty for the successful implementation of the Nova Plan. The problems surveys clearly reveal the importance of establishing effective vertical lines of communication between teachers and administrators, and horizontal lines of communication within the faculty and administrations separately.

The informal teacher interaction through which communication normally occurs in conventional schools cannot be assumed under the Nova Plan. Extensive departmentalization under Nova's system tends to separate the faculty and is apparently conducive to the kind of interdepartmental faction common to colleges and universities. Special planning is therefore necessary to insure both the vital lines of communication and the social cohesiveness of the faculty in a school such as Nova.

Much of the necessary communication concerning objectives, policies, procedures, curriculum, etc., could most effectively be provided through an inservice training program. Few Nova teachers felt adequately prepared to implement the Nova program without further training and information. The schoolwide program of teacher training and information dissemination

developed during the 1967-68 school year should insure greater understanding and implementation of overall school policy and procedures. Moreover, by providing a basis for professional and social interaction and communication between the departments, this inservice training program should tend to offset interdepartmental faction. While an informal program of inservice training may be adequate in most schools, a formal, intensive program with clearly stated purposes and procedures seems essential during the first years of implementation of the Nova Plan.

The final aspect of the Nova Plan which, according to the problems surveys, deserves special emphasis during the initial state of implementation is the need for a formal program of advanced curriculum development. Because the Nova Plan proposes that students move at their own rate, and appeals to many students who can move at a very rapid pace, teachers are under great pressure to stay ahead of the advanced students. Under the pressure to meet the needs of the advanced students, teachers may be able to do little more than provide for less capable students a watered down version of a curriculum designed primarily for high ability students. Thus, every effort should be made to begin in September with a curriculum outline for a full year and a detailed curriculum which can carry advanced students through the first five or six months. A curriculum written under the pressure to stay one unit ahead of the best students is subject to imbalance and to the inclusion of extraneous material which satisfies primarily the immediate demands of the more advanced students.

The full and immediate implementation of the Nova Plan, including complex programs for individualized instruction, inservice training and curriculum development, is a monumental task which places great demands on the time and energy of faculty and staff. Specialists and consultants

provide invaluable guidance, but the faculty and staff must get the job done. The long working hours reported and the necessity of returning during the weekends in the first years of operations were verified by personal observation on the part of the researcher in residence. The fact that the most serious, most pervasive, and most persistent problems arose from lack of time and opportunity for teachers to adequately fulfill their many responsibilities points up the need for overstaffing rather than understaffing for the first year in order to adequately meet the initial challenge of instruction, curriculum development and inservice training.

It is interesting to note that in 1966, when renewed efforts in program development were made under a reorganized administrative structure, the teachers' instructional load was considerably eased from what it had been in 1963. The student-teacher ratio had been lowered to 21.5 and students were scheduled for less regular classroom instruction, thereby freeing some of the teachers' time as well as instructional space for program development and implementation. As noted in the reactions of both students and teachers, the marked increase in student time allocated for independent study (i.e., SOUST) was not without its problems, but was perhaps the only way to make available the time and space necessary to develop and implement the Nova Plan. Even during the 1966-67 school year when SOUST was first introduced on a large scale basis for all students, the problems alleviated by SOUST may have more than offset the problems which resulted from SOUST.

Thus, the 1966-67 year may have marked a turning point in the development of Nova, and it is not unlikely that the more judicious

scheduling of independent study time on an individual basis during the 1967-68 school year may have restored a workable balance between the immediate instructional function and the long range program development function of Nova. This interpretation would be consistent with the teachers' response to the 1967-68 survey of student and teacher advantages within the Nova Program. Teachers asserted with little or no qualification that Nova afforded them the opportunity to engage in program development while working with students under a variety of conditions. Concerning the immediate benefits of the program for Nova students, however, the teachers were more apt to qualify their comments. In general, one might expect major periods of progress to be signaled early by teacher impressions of improved working conditions, but confirmed in terms of student performance on valid criteria only after an appreciable period of developmental effort and subsequent time for the new program to have a measurable impact. Thus, while results of the most recent teacher surveys may be an indication that the Nova developmental efforts have jelled into a workable pattern, the evidence by which to judge the success of these efforts would have to be collected on students over a period of the next three to five years.

The markedly superior performance of Nova students in mathematics and the enthusiasm of Nova students for the Mathematics program in the 1965-66 school year clearly show that the major goals of the Nova Plan are attainable in a given department if not on a school wide basis. That is, by dominating the scheduling and funding prerogatives between 1963 and 1966, the mathematics department was able to establish an individualized instructional program in which students did excel. By 1966, however, it was obvious that under the initial scheduling system,

individualization in one program could be attained only by severely limiting the scheduling options of the other departments. It remains to be seen if the recently instituted modular scheduling system, with an emphasis on independent study via Learning Activities Packages, will prove to be a viable approach to individualizing instruction in all departments simultaneously.

Finally, a word of caution about the interpretation of the evaluation surveys in particular. Although the many Nova innovations were treated as if each was independent of the others in the analysis of the data, it should be understood that the success of certain innovations is contingent upon prior success with other innovations. Undoubtedly there are many interdependencies among the innovations which require further analysis in the application of these findings. Some innovations judged satisfactory in the overall context of the Nova Plan may prove quite unsatisfactory in the context of a more conventional program, while certain innovations found unsatisfactory at Nova may be more effectively implemented in a more conventional program. Regardless of the circumstances, however, these data emphasize the need for careful analysis of the specific requirements for effective program implementation in terms of enrollment policy, scheduling, sequencing of certain innovations, and optimal utilization of school personnel, instructional space, and facilities.

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